
Electric Airport Vehicles

Clean Cities Conference

May 20, 2003

Background

- Sr. Commodity Manager - American
 - Ground Services
 - Ground Support Equipment
- Product Manager - AeroVironment
 - Develop Product Market -GSE
 - Develop New Products for GSE

Topics

- Challenges
 - Airport Infrastructure
 - The Ramp Environment
 - Ground Handlers
- Solutions
 - Power Sharing
 - Airport Participation
 - Equipment
- Establishing an Electric Fleet

Challenges

“We will deploy electric equipment on the ramp when the technology equals Internal combustion.”

- Cargo Airline

“There is no cost justification in deploying electric GSE.”

-Airline GSE Manager

“We see a significant benefit to electric GSE in both fuel and maintenance cost savings.”

-Major International Ground Handler



Airport Infrastructure

- Airport Challenges
 - Many aging airports struggle with infrastructure requirements.
 - Even new terminals are short power.
 - Electrical infrastructure is costly and sometime unavailable.

Ramp Environment



- Common areas and ramp space is scarce for installation of charging infrastructure.
- Not all airlines have designated space for GSE.
- Designated space is constantly being moved

Ground Handlers

- Outsourcing Ground Handling
 - Airlines contract handling services to save money.
 - Handlers work on 2- 5 year contracts.
 - Short contract terms prevent long term infrastructure investment.
 - Handlers turn to equipment that can be moved easily.

Solutions

- Power Sharing
 - Centralized 400hz - INET
 - Jet bridge Power - FMC
- Airport Participation
- Equipment
 - Common electric GSE
 - New Development

Power Sharing



- Partnership with INET to share centralized 400hz.
- Power prioritization.
- Especially economical with motor generator systems.

Power Sharing



- Partnership with FMC to share Jetbridge power
- Jetbridge requires power less than 5 minutes of every hour
- Mount system to bridge to save space

Airport Participation

- Airports are beginning to provide charging infrastructure to airlines and ground handlers that participate in electric programs
 - DFW
 - San Diego
 - Toronto

Electric Equipment



- Lavatory Service
- Baggage Tractor
- Baggage Loader

Electric Equipment



- Hydrant Fuel Truck



- Jet Airstart



- Maintenance Lifts

Electric Equipment



- Aircraft Tractor



- Towbarless Tractor



- Cargo Loader

Establishing an Electric Fleet

- Choose some partners
- Select technology with partners
- Choose the best location
- Find an employee group willing to test
- Put the equipment to the test
- Be realistic

Partners

- Infrastructure
 - Electrical design/installation
 - Charging company
- Equipment
 - Vehicle OEM's
 - Battery OEM's

Technology

- Vehicle Technology
 - AC vs. Drive System
 - Voltage (72,80,96)
- Charger Technology
 - Conventional
 - Fast Charging
- Battery
 - Gel vs. Flooded Lead acid

Location

- Select one or two gates in a “normal” operational area.
- Should be an area with dedicated vehicles and parking area.
- Available infrastructure

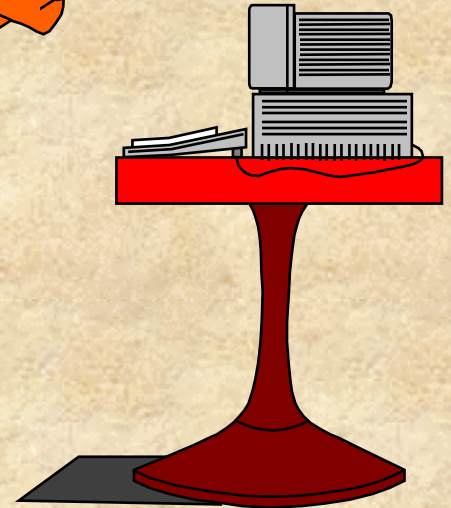
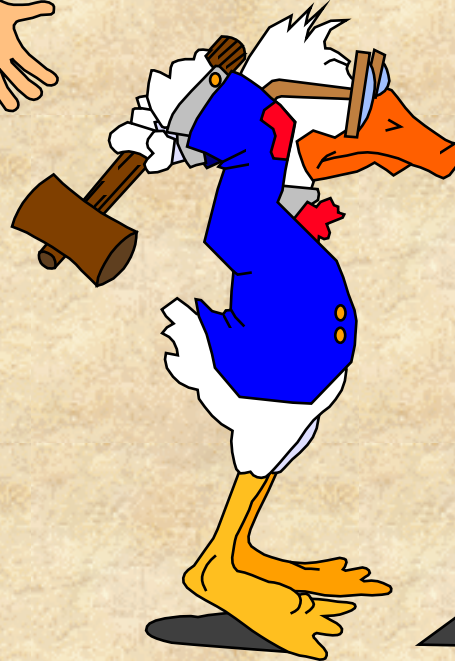
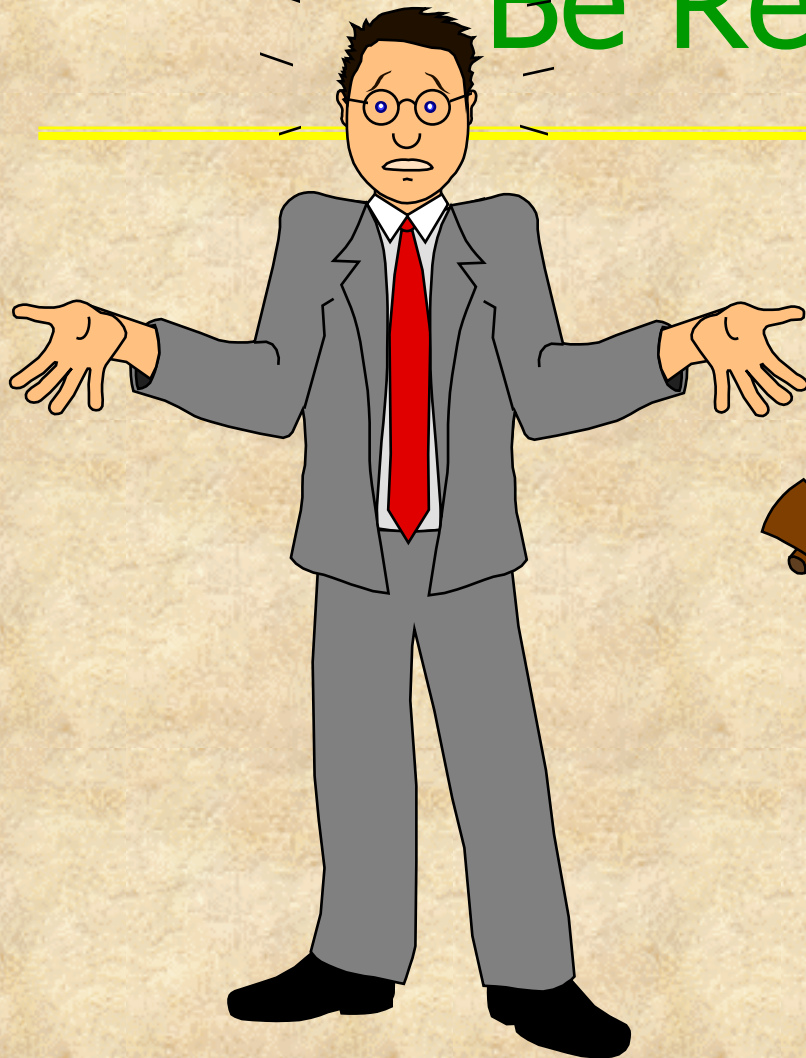
Employee group

- Employees can make or break a test
 - Open-minded
 - Well trained
 - Non-biased
 - Seniority

Test

- Fair test
 - “Normal” operation
 - Standard duty cycle - equal to IC
 - Test several models
 - Compare “like” equipment
 - Objective measurement system
 - Objective measurement device

Be Realistic



Conclusion

- Any Questions??